

Toppling the tyranny of the 2nd Law of Thermodynamics

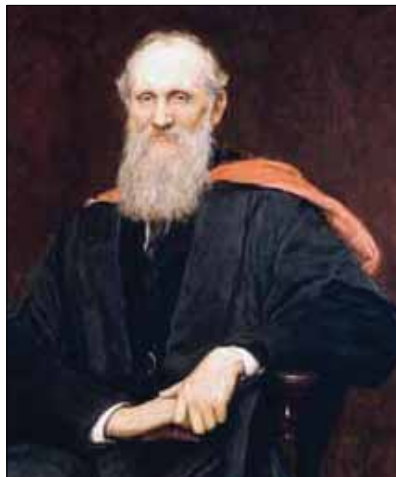
by Bruce Director, part 2 of 2

Bruce Director, a member of the U.S. Board of the Schiller Institute, gave this speech to the Institute's conference in Berlin on Feb. 25. It can be viewed online: <http://schiller-institut.de/seiten/201202-berlin/director-english.html>

The entire conference is available online: <http://schiller-institut.de/seiten/201202-berlin/konferenz.html>.

Kelvin and Clausius: Heat Death

It actually probably began in the middle of the 19th Century, with the writings of Lord Kelvin, who initially was known as William Thomson, but probably because of his writings on heat, he was made the first Baron Kelvin of Largs by Queen Victoria, for articulating what became the center of their cult religion. And Thomson (Lord Kelvin) wrote many works on this, one called *On the Universal*



Lord Kelvin (1824-1907)

Tendency for the Dissipation of Mechanical Energy, in which Thomson said: Since heat only flows from hot to cold, and always tends toward equilibrium, and since all action in the universe ultimately turns into heat, therefore all mechanical energy, all action in the universe, is going to eventually turn into heat; all the heat is going to flow from hot to cold, and ultimately go into equilibrium, and therefore the universe will inevitably come upon an ultimate heat death. In which all motion will stop, and everything will stop.

In such a conception of the universe, what is the meaning of human life? What is the power of the human mind? Man might be able to make inventions and make discoveries, or compose beautiful compositions, but it's all meaningless, because ultimately, according to Lord Kelvin, the universe is going to die in an equilibrium heat death. Now, of course, this is a pretty unscientific view, and it fell to Rudolph Clausius to actually try and come up with a more rigorous scientific concept of this ultimate heat death of the universe. So he wrote a book on heat and heat-powered machines, in which he basically reworked the ideas of Sadi Carnot, and he looked at this question of how, in a machine, you get this dissipation of heat, and he coined a new term, because you can get a dissipation of heat without changing the amount of heat in the machine, and so he said there has to be a new idea other than energy. So he invented a word which he called "entropy." He wanted it, as he says, to sound as close to "energy" as it could. From the Greek word change (*trope*) and the prefix *en*: internal change. He asserted that this is a measure of the potential for change. And he gave it a mathematical expression, in which an increase in entropy was a decrease in the potential for change, and a decrease in entropy corresponded to an increase in the potential for change.

So, that's a little trick he plays, but then at the very end of this book he makes the most radical assertion, without any foundation whatsoever, in two statements. The very last two sentences of his book on machines are: "The energy of the universe is constant;" and "The entropy of the universe always tends toward a maximum."

Now, on what basis does he make an assertion about the universe, from a narrow investigation of a heatpowered machine? It's completely absurd. But that became, and has become, basically, as I said, a central tenet of a cult-religion, where people believe this; they will state it as a mantra, or believe it without any basis for realizing that they're making a statement about the universe which is completely without foundation.

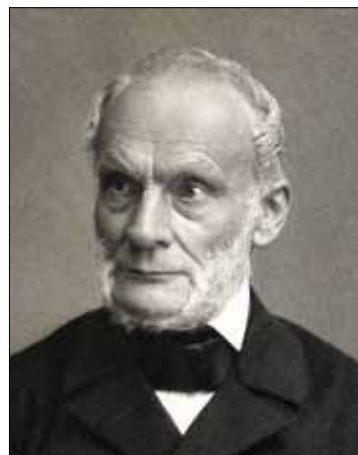
Boltzmann: Probability, Not Causality

Now, of course, because it was without foundation, it required that there be some kind of basis to say *why*. Why does the heat always tend toward equilibrium? What is the purpose of this? And nobody could come up with an actual causal reason consistent, for example, with Leibniz's idea of least action, the curve of the catenary, or the pathway of the planet in a Keplerian orbit, which is a pathway that is determined because it's the least action pathway with respect to the physical principles that are acting. No such formulation could occur to give a foundation for the Second Law of Thermodynamics.

So this task fell to Ludwig Boltzmann, who introduced into science a completely new basis for a foundation, which was the mathematics of probability. Equilibrium, according to the mathematics of Boltzmann, was a more *probable* state than disequilibrium. That is, a change from a higher state of organization to a lower state of organization, in which no more change is possible, because equilibrium is a state in which there is no more change—you can't get more equilibrium than equilibrium! When you get to equilibrium, you've reached the end.

And so, Boltzmann said, that's a more probable state—again, an assertion that has no foundation. It's true that equilibrium doesn't change any more, but why should that be more probable, than a state of disequilibrium?

And so, this introduced a new false idea, which was that the universe was fundamentally random, and that anything that happened in the universe happened because it was more probable



Rudolf Clausius: "The entropy of the universe always tends toward a maximum."



Ludwig Boltzmann: "Man cannot know causality in the universe, only "probability."

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than were it not to happen.

Well, how is the composition of Beethoven's Ninth Symphony a "more probable" event, than its non-composition? How is the creation of a great work of art something more probable than were it not to occur?

But remember the process we saw, with the development of mankind through new scientific discoveries, which, by their very nature, when they come into existence, prove that the way everybody was thinking about the world, is wrong. That man's future development depends on *only* the improbable, the improbable event that somebody will come up with a new creative discovery that proves the way everybody thinks is wrong. How, from that, do you get that equilibrium is the most probable state?

This, again, is the underpinnings of the Green movement: that anything man does disrupts the balance of nature; that somehow nature seeks a balance; that somehow the universe is seeking a state of equilibrium.

The British Imperial Project

These doctrines are not just falsehoods that affect the design of machines, or academic scientific theories. These are false doctrines which were used by the British Empire, to build a political movement, a social movement, which was consistent with what else was going on at the end of the 19th Century. A pessimistic movement that was being pushed, to counter the optimism that was expressed by Lincoln's victory over the Confederacy in the Civil War; and the achievement in the U.S. of a continental economy, and the spread of that to Europe, especially to Germany and Russia, and then into Asia, through Japan, in the second half of the 19th Century, a potential for what we want now: The development of continental powers based on increasing man's power in and over nature through technology.

And the British wanted to destroy that, because that was obviously a threat to their Empire, a threat to the imperial system, which tried to maintain a balance of power; tried to impose an equilibrium on society. And so, the introduction of this false scientific idea was an essential ingredient to the maintenance of that imperial organization of society.

And of course, it led to the predictable result: The attempt to impose such an equilibrium, against what was in the best interests of mankind, led to the disaster that we now call World War I.

Planck's Refutation

And this issue, as I'm stating it today, was spoken about on the eve of that disaster, by no less a scientific authority than Max Planck. Right here in Berlin, in August 1914, as the "guns of August" were mobilizing, he spoke at the Kaiser Wilhelm Institute, and addressed this question of the absurdity in science of accepting the idea of what today we would call the Second Law of Thermodynamics, as a universal law. Planck gave a rigorous investigation of it, showing the assumptions which un-



Kelvin's vision of the heat death of the universe was aptly foreseen by Peter Bruegel the Elder's "The Triumph of Death" (1562).

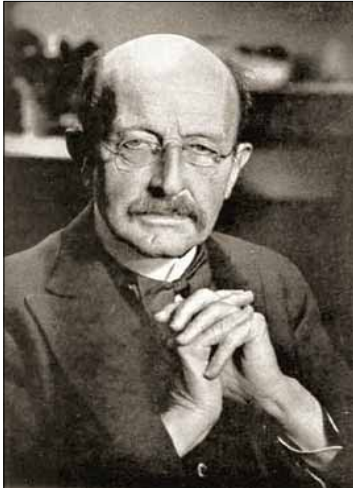
derlie it. So that if a scientist is going to use a certain theoretical framework, the scientist has to understand, what are the underlying assumptions on which that theoretical framework is based, so as to avoid error.

And after giving this rigorous discussion of thermodynamics, Planck says that one cannot, however, apply any of these concepts to mankind. Because mankind is governed by moral law; and moral law, as Planck said, is typified by the question, "What am I to do with my life? As a mortal human being, what is my immortal contribution, not only to mankind, but how do I contribute something that expands the universe as a whole?" And Planck, and his collaborator Einstein, who also held this view, were bitterly attacked, because the pressure from the British Empire was to go back to the days before the Black Death. The Second Law of Thermodynamics had become the New Aristotle, the new fixed system, in which everything tends toward a greater and greater state towards equilibrium.

And Planck's insistence that science and man must be governed by moral law, not false doctrines, was antithetical to what science was becoming at the time, especially typified by things like the Copenhagen interpretation of quantum mechanics, which held, again, that the very fundamental characteristic of the universe was random and probabilistic.

Planck starts his speech by saying, "We don't know"—think about it, August 1914—"We don't know what's going to happen to us tomorrow." It's a very similar situation to where we're in today: We don't know if something's going to happen, whereby we will lose our country. But the answer to that is not found in saying, "Well, what will happen will be whatever is the most probable thing." The most probable thing to happen to us, in the next few weeks, is to become extinct in a thermonuclear war! So, if you think the universe is predisposed to the most probable thing, that's what you get!

Obviously, human existence depends on, not the most probable, but on what appears to be the most *improbable*, which is something based on moral principles. And this means, in my view, that science actually has to develop a foundation of a new concept



Max Planck: *Concepts of thermodynamics cannot be applied to man, because mankind is governed by moral law.*

of an *antientropic* potential, a potential which characterizes man and the universe, as a tendency for development from lower to higher states of organization and existence, a creative principle.

Now, just parenthetically, this is also sometimes confusing, because of the term “anti-entropy.” Because I’ve just described that the concept of entropy, as Clausius introduced it, is a false idea; so, why would we say, what the universe really is, is not what it isn’t? And sometimes people get confused about the question of “anti-entropy.” But because the concept of entropy and the increase of entropy is ingrained, it’s absolutely essential that we make the point in this way. However, I think that at some point, we have to have a positive term which actually defines, scientifically, this creative notion. I propose the term “dynatropy,” from dynamic change. And we’ll see if that ever takes hold. But, this means that we have to have a concept of a potential, which has an intrinsic characteristic to generate a new potential. And there’s much we can say about this, but I think the best way, at least, to get this concept across in this setting, is to first think about how the human mind works.

How the Mind Works

I’m reminded in this respect, the example I think is the most instructive, is Plato’s *Meno* dialogue. It is the story, where Socrates is arguing with Meno, who is a bit of an oligarch, about what is the nature of man. And Socrates is arguing that the nature of man is essentially creative, to discover new things, even from within himself. He says this new discovery is an intrinsic character of the human mind, to generate something from within itself, which is totally new and changes itself.

And he uses the example of trying to teach the slave boy how to double the square. He says, I’m going to show that the slave boy will be able to discover how to double the square, without telling him how to do it, but by simply asking him questions. And you know the story, that the slave boy, just by being asked questions, doubles the square, and not only amazes himself, but also Meno, who thought the slave boy was too stupid to ever learn what, at the time, was one of the most important principles of science.

But, what was the discovery there? The discovery was not the discovery of how to double the square. The slave boy did discover that, but the discovery was about the power of the human mind: The slave boy, in the nature of that discovery, *showed himself*, from *within himself*, that he had a power to change himself into something he hadn’t been. And the act of doing that in front of Meno, changed Meno, because it proved to him that his view of man was wrong. Now, he wasn’t changed by it, but that’s a whole other story.

But you see in that example, and in the example of human creativity generally, that the human mind contains within it a type of anti-entropic potential. Because the new discovery is not *in* the mind, until it’s discovered, but the discovery is the effect of a potential, which is a potential not to continue to do what it’s doing, but a potential to create something totally new. And the essential characteristic about this, as Mr. LaRouche has always emphasized, is that this does not occur simply in the individual human mind,

but the individual human mind makes these discoveries only with respect to human culture, as it radiates across the generations, past, present, and future.

So that there’s a type of harmonic interaction between the creative powers of an individual human mind, and society as a whole and culture as a whole—when I speak of that, all the generations. We absorb the creative discoveries, not through osmosis, but by replicating those discoveries in our own minds, and we add to the culture, the creative discoveries that we make. Because the action of the individual mind on the universe doesn’t occur directly from the individual mind, but only through this development of culture. So, human culture, as it evolves to higher and higher states of knowledge of man and knowledge of the universe, represents the concept of an anti-entropic potential field.

I think the greatest advance in this direction, in science to date, really, has come from Lyn’s work and breakthroughs in the science of physical economy, which truly lay the foundation and develop the concepts of what I’m calling today an anti-entropic potential field. But the roots of it, I think, you can find in the work of Nicholas of Cusa, in especially two works that he wrote, on this question of potential: One was the work called *De Possest*, a word he made up, from the Latin word *posse*, which means possibility, and *est*, to exist. And a later work, he called *On the Summit of Vision*, in which he refers to “the idea of the potential itself.” And Cusa says that it’s the potential which is where ontological existence, where reality lies, not in the thing.

He gives an example of life: Living things exist, so life exists, but life itself does not account for its own existence. What accounts for the existence of life is that the possibility for life exists in the universe. These forms of potential, the potential for life, he calls “potentials with additions.” And then, Cusa says: But what’s the most important thing to understand, what’s the summit of vision, is what he calls the potential itself, which is the potential which makes potential possible. Why do we live in a universe in which it’s possible to make things possible? And when you think of the power of the human mind, you see that’s exactly what the human mind does.

An Anti-Entropic Potential Field

So, from this standpoint, if we start with the nature of the human mind, we can begin to construct an actual, communicable concept of the idea of an anti-entropic potential field. But, as LaRouche has emphasized, the problem we have, is how do you express such an idea? Because all our language, no matter how skillful we are, is rooted in sense perception. The language you have, that is, all the words you use and all the concepts, are tied to some type of object or action which you know through sense perception.

Now, we recognize that, in certain abstract concepts, such as justice, or truth, or love, we have to rely, not on direct language, but on metaphor; to be able to communicate such ideas, and we, of course, recognize that we’re indebted to the poets and the artists for being able to develop the forms of expression by which we can communicate concepts which lie completely outside the domain of sense perception.

But this is true, also, in the domain of science, where you think you’re looking at and dealing with things that are concrete, things which exist in the domain of sense perception, or appear to be, such as supernovae, or living things. And this is something, also, that LaRouche has been quite provocative about, which I think everybody appreciates how provocative, but also how truthful it is, going all the way back to the 1970s, when LaRouche wrote a paper titled “Poetry Must Begin To Supersede Mathematics in Physics” (*Fusion*, October 1978, it can be viewed online as pdf

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file: http://wlym.com/~fusion_archive/fusion/fusion/19781010-fusion.pdf.

So, in order to express this concept of an anti-entropic potential field, we have to actually use the principle of metaphor that we see from the great scientists.

The concept we have to express here, is a concept of a potential field, which has the potential to create a state which doesn't exist, and which is a higher state of organization of existence, and which is a necessary state of organization existence. Which means that there must be an intrinsic power in this anti-entropic potential field, the same power which we associate with the passion that's required to make the decision today, that the human race is not going to be extinct. We can all sit in this room, and agree, that we would prefer going to Mars and developing mankind, than to become extinct in the next three weeks, but without the passion to make that happen, the most probable will happen, and not the necessarily improbable.

So, our notion of an anti-entropic potential field has to have a characteristic of passion, and our science must be able to deal with this question of passion, and power. And because this is a necessary transformation: The anti-entropic potential field must exert a pressure, a pressure towards higher states of organization of existence. We see this in the question of evolution, as well.

And there's a tension also associated, which is the resistance that the anti-entropic potential field exerts on *any* attempt to produce and to increase entropy. So, rather than an increase in entropy being the characteristic of the universe, the decrease of entropy is the characteristic of the universe, and a tension arises in any attempt to impose an increase in entropy.

A Riemannian Approach

Now, this, of course, is quite a difficult program, which I outlined that we have to develop, and I don't claim to have solved the problem, but I think that by stating it in this way, we can perhaps get more of a scientific approach to solving the problem. And I'll just give a very quick indication of the kind of concepts which I think are appropriate to this.

For that, we should look at probably the greatest person who exemplifies the idea of replacing mathematics with poetry, or poetry superseding mathematics in science, and that's Bernhard Riemann, who, in all his work, showed that any attempt to try and express the way the human mind works through deductive mathematics, obviously fails, and all deductive mathematical systems are totally worthless.

His seminal work on this, was a paper he wrote which is too technical to discuss here, called "On the Subject of Abelian Functions." But in that paper, Riemann introduces an idea of connectivity, and that, as a way to express the development of a system from a lower to a higher state, the development of a potential from a lower state of potential to a higher state of potential. We can see this in the noetic domain, in the domain of human culture: That is, if you think about it, as we add to human knowledge through the development of new scientific principles and new creative discoveries of art, across the generations, we increase the connectivity among the individual minds, all



FIGURE 6
Proposed Transport Routes (Projection from the North Pole)

mankind, and the universe as a whole.

And we see this also expressed, for example, in economics. In this map of the Arctic development (Figure 6), I would just ask you to think about the economy, think about the connections in the economy, between the way the world is now, and the way it's headed. What is the relationship, for example, between Tierra del Fuego and Shanghai? What is the relationship of Berlin to Vietnam? And you think in your mind of different connections: sea transport, air transport, trade among products, different labor relations, and so forth. But what if we actually look at the world in a different way, and think about what would be the actual frontier development for the future of mankind?

And you can see this exemplified in the program for the Arctic development, where we take this region of the planet, which right now is pretty barren and empty. But when you look at the globe from the North Pole, you see that this is actually the most crowded place: It's from the North Pole that we find that countries which you think are widely separated, are very close neighbors. And by building the Bering Strait tunnel and subsequent high-speed rail connections, we change the connectivity of the planet, we change the connectivity of mankind. And we bring about a higher state of development that previously didn't exist.

So, as I said, this is just a beginning of what kind of direction science must go. We have to abandon the Second Law of Thermodynamics, and put the creative minds of the scientific community to work, to elaborate and develop this concept of an *anti-entropic* potential. And, to paraphrase Riemann's great habilitation paper, this is a subject in which we must enter the domain of politics, and the current occasion emphatically demands that we do so.